

薄层营养液膜技术(NFT)水培多年生黑麦草对不同富氮废水的净化效果

Treatment efficiency of different nitrogen-rich wastewater using *Lolium perenne* L. cultured by nutrient film technique

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英文关键词: nitrogen-rich wastewater treatment; nutrient film technique; *Lolium perenne* L.; nitrite; ammonia; nitrate; unionized ammonia

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中文摘要:

采用薄层营养液膜技术(NFT)培育多年生黑麦草(*Lolium perenne* L.),以草带为植物滤器净化5种不同配置的富氮废水,废水10 d更换一次。试验结果表明在短期内(2 d),TAN、 NO_2^- -N和 NO_3^- -N的去除量均在本身高水平而其他成分低水平的试验组达到最高,4组非离子氨UIA的净化率均高于99%。所有废水的pH值在2 d后均被控制在6.5~8.0。以上述3种氮90%的净化率为目标,废水G3(初始浓度为TAN: $40 \text{ mg} \cdot \text{L}^{-1}$, NO_2^- -N: $40 \text{ mg} \cdot \text{L}^{-1}$, NO_3^- -N: $10 \text{ mg} \cdot \text{L}^{-1}$)和CK(仅在26.77 L自来水中加入18.36 g四水硝酸钙)需2d,废水G4(TAN: $40 \text{ mg} \cdot \text{L}^{-1}$, NO_2^- -N: $4 \text{ mg} \cdot \text{L}^{-1}$, NO_3^- -N: $10 \text{ mg} \cdot \text{L}^{-1}$)需4 d,废水G1(TAN: $140 \text{ mg} \cdot \text{L}^{-1}$, NO_2^- -N: $40 \text{ mg} \cdot \text{L}^{-1}$, NO_3^- -N: $80 \text{ mg} \cdot \text{L}^{-1}$)、废水G2(TAN: $140 \text{ mg} \cdot \text{L}^{-1}$, NO_2^- -N: $40 \text{ mg} \cdot \text{L}^{-1}$, NO_3^- -N: $10 \text{ mg} \cdot \text{L}^{-1}$)仅TAN和 NO_2^- -N在6 d内完成。试验结束时G3草净增长最高(169.3 mm),并获得最大干草产量 $0.205 \text{ kg} \cdot \text{m}^{-2}$,G4获得最大鲜草产量 $1.48 \text{ kg} \cdot \text{m}^{-2}$ 。

英文摘要:

Plant filters with $0.4 \times 2 \text{ m}$ Nutrient Film Technique(NFT) culture grass (*Lolium perenne* L.) strips were used to treat 26.77 liters five types of nitrogen-rich wastewater which were renewed periodically, every 10 d, marked as G1, G2, G3, G4 and CK. Wastewater G1, G2, G3 and G4 were composed with TAN of 139.6, 139.0, 39.0 and $39.3 \text{ mg} \cdot \text{L}^{-1}$, NO_2^- -N of 40.7, 4.1, 40.4 and $4.1 \text{ mg} \cdot \text{L}^{-1}$, and NO_3^- -N of 75.5, 9.7, 9.5 and $74.7 \text{ mg} \cdot \text{L}^{-1}$, respectively. Wastewater CK group was only with high level NO_3^- -N, $73.9 \text{ mg} \cdot \text{L}^{-1}$. It was found that the greatest removal mass of each nitrogen compound among the first two days of every period was obtained in the group with higher level of that compound and lower level of other two compounds. It took two days for all groups to clean more than 99 percent of un-ionized ammonia and keep pH value between 6.5 and 8.0. With a view of 90 percent absorption of three nitrogen compounds, group G3 and CK only spent two days, shorter than four days of G3, while G1 and G2 failed all period long except for TAN and NO_2^- -N. In terms of grass product achievements at the end of the experiment, group G3 achieved the highest height increase of 169.3 millimeters and the most dry grass yield of 0.205 kg per square meter, and group G4 got the most fresh grass yield of 1.48 kg per square meter.

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